The Role of Same-side and Cross-side Influences in the Multinational Diffusion of Two-Sided Digital Platforms

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Two-sided digital platforms have proliferated across geographically distinct locations. However, the impact of how diffusion forces affect each side of these platforms across geographies has yet to be fully characterized. We develop a two-sided diffusion model that captures the growth of crowdfunding platforms across countries. We analyze how each side of a platform in a specific country influences the other side's growth while also considering the effect of the platform's growth in other countries. Using data from Kickstarter, we examine the diffusion forces within and across 25 countries. Our dataset consists of adopters on both sides of the platform: those founding projects and the backers who fund the projects. We find that innovators fuel the growth of creators to a greater degree than backers. Furthermore, we find that same-side participation is a greater driver of growth than cross-side participation. Finally, we identify "influencer" countries for each side of the platform.

Keywords: Multinational Diffusion, Two-Sided Platforms, Crowdfunding

Track: Digital Marketing & Social Media

1. Introduction

Since the beginning of the new millennium, digital platform businesses such as online marketplaces like eBay and Amazon, 'sharing economy' firms like Uber and Airbnb, or crowdfunding firms like Kickstarter have risen to prominence and now dominate the business landscape in many industries. Operating as 'two-sided markets' (Armstrong 2006; Rochet and Tirole 2003, 2006; Evans 2003; Rysman 2009; Evans and Schmalensee 2016), these platforms primarily facilitate exchanges between buyers and sellers (Sridhar et al. 2011). Enabled by the Internet and mobile apps, they transcend geographic barriers, connecting buyers and sellers globally with unprecedented ease. Reflecting this transformation, the number of publicly traded digital platforms tripled from 50 to 150 between 2015 and 2020 (Acs et al. 2021), fueled by entrepreneurs aiming to disrupt traditional business models and optimize value exchanges. While marketing literature on innovation diffusion (e.g., Mahajan et al. 2000) offers insights into growth forecasting, it has predominantly focused on 'one-sided' markets, as two-sided platforms were rare in the last century.

Surprisingly, however, despite the proliferation of digital platforms in recent years, a perusal of even more recent reviews of innovation diffusion and new product growth models research in marketing (e.g., Peres et al. 2010, Chandrasekaran and Tellis 2017, Muller and Peres 2019), reveals a striking absence of research explicitly modeling and estimating the diffusion of two-sided innovations. Notably, none of these comprehensive reviews provide an example of two-sided platform diffusion; for instance, Muller and Peres (2019) focus on how innovation growth is shaped by social network structures rather than addressing the diffusion of digital social network platforms themselves. Furthermore, while digital platforms operate in inherently global markets, there remains limited research modeling and empirically investigating the cross-country effects of two-sided digital platform diffusion. Among the few relevant studies, Chu and Manchanda (2016) examine the growth of Alibaba's Taobao consumer-to-consumer (C2C) platform, and Li et al. (2018) analyze Groupon's online-to-offline (O2O) platform. However, neither adopts a diffusion model perspective or considers cross-country effects. Kumar et al. (2021) provide a notable exception, applying a diffusion model to study two-sided platform growth across countries, but their work focuses on the industry-level rather than brand-level growth of mobile payments and does not incorporate cross-country effects in the diffusion process.

Considering the above lacunae in the literature and the pressing need among entrepreneurs for more insight into digital platform diffusion, this paper aims to expand knowledge on the global diffusion of digital platforms. Specifically, we extend the classic Bass (1969) diffusion model to analyze the growth of two-sided digital platform innovations within and across countries. Using Kickstarter as an empirical context, this study examines the rapidly growing crowdfunding market, which is disrupting financial lending markets and is projected to grow by 16% annually, reaching $60 billion by 2030 (Research 2023). Kickstarter, a leading reward-based crowdfunding platform, has facilitated over $7 billion in pledges and funded 250,000 projects, exemplifying how entrepreneurs attract funding for innovations while offering backers early access or tokens of appreciation (Thies et al. 2018; Tan and Reddy 2020).

We analyze 13 years of data (2009–2021) from Kickstarter, focusing on project creators (fundraisers) and backers (funders). Since its inception in the US in 2009, Kickstarter has expanded to 25 countries. Using a two-sided diffusion model, we estimate same-side innovation and imitation effects (e.g., social influence through word-of-mouth or network effects; Peres et al. 2010) and cross-side network effects between creators and backers. Additionally, the model examines cross-country influence effects, assessing their relative strengths and asymmetries in driving platform growth globally. In this manner, we specifically investigate and shed light on the following substantive research questions in the Kickstarter empirical context.

RQ1: Within the context of digital crowdfunding platforms, are innovation effects more pronounced in the case of project creators or project backers? Which same-side social influence (imitation) effects are stronger?
RQ2: To what extent do numbers of multinational pledges influence the adoption of crowdfunding platforms? Do multinational pledge same-side or cross-side effects have a greater impact on platform growth?
RQ3: Do certain countries exert disproportionate influence on the evolution of the platform in other countries? Do certain countries influence the growth of one side of the platform more than the other?

Our empirical investigation of these questions yields a number of interesting findings that are new to the crowdfunding platform research literature. Among these, we find that the

'innovation' effect is stronger on the creator side of the platform than the backer side. We also find that platform participatory behavior has distinct effects on adoption. We observe that same-side participation effects are stronger than cross-side effects. Finally, our estimates also allow us to quantify the differences in the growth of crowdfunding across countries. We observe that countries are affected by multinational influences to varying extents. For instance, multinational effects are relatively more impactful when the platform is first launched in a country, before local imitation has had a chance to gain momentum.

This paper makes the following contributions to the marketing literature in general, and digital platform research in particular: (i) To the best of our knowledge, this paper is the first to formally extend the Bass diffusion framework to model and empirically estimate the adoption of a two-sided digital platform brand in a multinational context. Thereby, in an era when platform innovations are being launched at a high rate globally, we shed new light on how digital platforms grow across countries. (ii) Methodologically, the proposed model extends the multinational network model of diffusion of a one-sided innovation and Bayesian estimation approach utilized by Albuquerque et al. (2007). (iii) The research offers new insights into the diffusion of digital crowdfunding platforms such as Kickstarter and the roles and relative influence of growth in backers versus creators across countries. In particular, the same-side, cross-side, and cross-country effects of backers on creators (and vice versa) revealed by our research make an important contribution to the digital crowdfunding platform literature and industry.

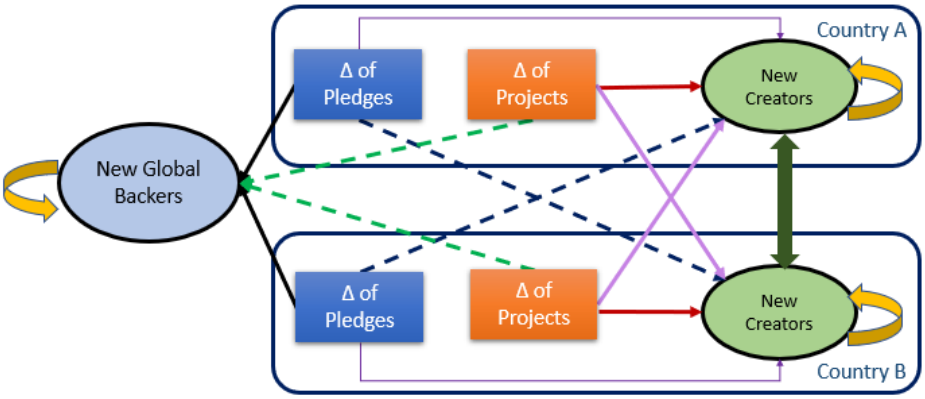
2. Modeling Framework

To fill the gap in prior literature regarding diffusion of two-sided systems, we formulate platform growth as a function of two constructs that each affect platform adoption: the *number of adopters* (creators and backers) and the *number of participatory instances* (pledges and projects). With respect to the number of adopters, growth on each side of the platform is driven by the innovation and imitation parameters typical to Bass diffusion processes. That is, a proportion of users independently adopt the platform (innovators), while others (imitators) are influenced to adopt by the number of previous adopters. However, once an adopter (a creator or backer) has joined the platform, their subsequent participatory behavior may also affect platform growth. That is, engagement on the platform could vary over time, even with a fixed number of

adopters, leading to effects distinct from the diffusion process. In the context of crowdfunding platforms, creators and backers can participate any number of times after adoption. Creators participate by creating new projects, and backers participate by pledging.

Figure 1 is a visual representation of our conceptualization of the multinational growth dynamics for two-sided platforms, in this case for the context of crowdfunding platforms. Backer and creator adoption (ovals) are affected by same-side imitation effects (yellow arrows) and participation effects (solid one-way arrows). Participation (rectangles) is measured as the change in the number of pledges and projects from one time period to the next. Finally, with respect to multinational effects, imitation (dark green double-arrow) and participation (dashed one-way arrows) from one country may affect another.

Figure 1: Two-sided Adoption and Participation



Given this framework, we now formally define a multinational Bass-style diffusion model that captures the different elements that affect the growth of each side of the platform. Specifically, there are two interrelated diffusion equations, one for backers and another for creators. As previously noted, we expect that the growth of each side of the platform is driven by innovation effects, imitation effects, and within- and cross-country participation. We define the number of new global backers, b_t, and country i's new creators, $c_{i,t}$, in year t as diffusion processes with the following form:

$$b_t = \left(p^B + q^B \frac{B_{t-1}}{M^B}\right)(M^B - B_{t-1})\omega_t + \epsilon_t^B \qquad (1)$$

$$c_{i,t} = \left(p_i^C + \sum_{j=1}^{N} q_{i,j}^C \frac{C_{j,t-1}}{M_j^C}\right)(M_j^C - C_{j,t-1})\chi_{i,t} + \epsilon_{i,t}^C, \qquad (2)$$

where p are the coefficients of innovation, M are the market potentials, and B_t and $C_{i,t}$ are the cumulative creators and backers, respectively, at time period (year) $t = 1, \dots, T$. Consistent with Bass diffusion models generally, we specify that all imitation effects depend on the proportion of cumulative adoptions to market potential. For creators, when $i = j$, $q_{i,j}^{C}$ represents local same-side imitation effects (the effect of creators on creators within country i). When $i \neq j$, the $q_{i,j}^{C}$ term capture the multinational same-side effects of country j on country i. We assume that the errors, $e_{i,t}^{C}$ and e_{t}^{B}, are distributed normally with mean zero and variance proportional to the previous year's number of new creators and backers, respectively. The ω_t and $\chi_{i,t}$ terms are akin to 'marketing' influence terms in the generalized Bass model (Bass, Krishnan and Jain 1994). We utilize these to capture the influence of platform participation behavior. These are defined as:

$$\omega_t = 1 + \alpha^{B} \frac{(D_{t-1} - D_{t-2})}{D_{t-2}} + \delta^{B} \frac{(R_{t-1} - R_{t-2})}{R_{t-2}} \quad (3)$$

$$\chi_{i,t} = 1 + \sum_{j=1}^{N} \alpha_{i,j}^{C} \frac{(D_{i,t-1} - D_{i,t-2})}{D_{i,t-2}} + \sum_{j=1}^{N} \delta_{i,j}^{C} \frac{(R_{i,t-1} - R_{i,t-2})}{R_{i,t-2}}, \quad (4)$$

where $D_{i,t}$ is the number of pledges and $R_{i,t}$ is the number of projects. The effects of the changes in the number of pledges and projects on the platform are captured by α and δ, respectively. For creators, when $i \neq j$, $\alpha_{i,j}^{C}$ and $\delta_{i,j}^{C}$ represent the effects of multinational participation on focal country i. Equation (1)-(4) are estimated using Bayesian (MCMC) methods.

3. Data and Analysis

To apply our model on two-sided multinational diffusion to investigate the growth of crowdfunding platforms, we use data from Kickstarter. Our dataset contains 13 years of Kickstarter data, from 2009 to 2021, across 25 countries for both sides of the platform. Consistent with our model formulation above, our data contains the number of new project creators per country each year $c_{i,t}$ and the total number of global backers joining the platform each year b_t. Kickstarter first launched in the United States followed next by English-speaking countries: the United Kingdom, Canada, Australia, and New Zealand. These were then followed by European countries and finally Asian nations.

3.1 Results

We now present our parameter estimates, which allow us to answer our research questions. Table 1 presents the estimated parameters from Equations (1) – (4) for the backer and

creator sides of the platform. Standard deviations of the parameters across iterations of the MCMC sampler are in parentheses.

Table 1: Parameter Estimates

	Backers	**Creators**
Market Potential (M)	1.945 × 10^7	31.973 (per 100K)
	(7.279 × 10^5)	(4.9408)
Innovation (p)	0.0008	0.0322
	(0.0000)	(0.0584)
Imitation (q)	0.2883	0.1459
	(0.0806)	(0.0691)
Multinational Imitation ($\sum_{i \neq j} q_{i,j}^{C}$)		0.1284
		(0.0598)
New Projects (δ)	0.3014	0.2375
	(0.3473)	(0.0924)
New Pledges (α)	0.5523	0.1724
	(0.3370)	(0.0794)
Multinational New Projects ($\sum_{i \neq j} \delta_{i,j}^{C}$)		0.5319
		(0.1734)
Multinational New Pledges ($\sum_{i \neq j} \alpha_{i,j}^{C}$)		0.3664
		(0.1145)

The estimated coefficients for diffusion innovation are 0.0008 for backers and 0.0322 for creators. The same-side imitation coefficient for backers is 0.2883. The within- and cross-country imitation effects for creators are 0.1459 and 0.1284, respectively. The general magnitudes of these estimates are consistent with those from past literature on consumer durables and management standards (Albuquerque et al. 2007). With respect to participation, the effects of new projects and pledges on the growth of backers are 0.3014 and 0.5523, respectively. The within-country effects of projects and pledges on the growth of creators are 0.2375 and 0.1724, respectively, and the cross-country effects 0.5319 and 0.3664, respectively.

Table 1 reveals several insights about the growth of two-sided crowdfunding platforms. First, innovation is a much more important driver of growth for the creator side of the platform than for the generation of new backers. This is consistent with the fact that project creators on crowdfunding platforms are typically entrepreneurs and more likely to engage with the platform free from outside social influence. Also, total imitation effects are similar across both sides of the platform. For creator adoption, the effects of cross-country imitation are roughly similar to those of within-country imitation. With respect to participation, we observe that same-side effects are stronger than cross-side effects. For backers, an increasing number of pledges has a greater effect on growth on the platform than an increasing number of projects. Similarly, an increasing number of projects has a greater effect on creator adoption than an increasing number of pledges. For creators, multinational participation also tends to have a stronger effect than local participation.

Using these estimates, we examine the effects of individual countries on one another. Generally, we find that, with respect to multinational diffusion effects, English-speaking countries tend to be the most responsive to the growth in other countries primarily due to the impact of the United States. With respect to participation, Belgium, the Netherlands, Luxembourg, and Australia are the most sensitive to other countries' new pledges and projects. Scandinavian countries, Canada, and Singapore tend to be the least affected by the number of new pledges and projects from other countries.

Overall, these observations suggest that crowdfunding platforms should prioritize the initial recruitment and growth of the number of backers willing to support projects to foster the growth of the whole market. Due to higher innovation effects, new creators are more likely to join the platform on their own, and additional backers have greater impact in motivating participation from new backers. Platforms should also stimulate growth through same-side marketing efforts or incentives (refer a friend, etc…), given the stronger same-side effects of participation.

4. Conclusion

In this paper, we develop a Bass-style diffusion model that captures the growth of two-sided, multinational digital platforms. Our approach makes three contributions to the diffusion modeling literature. First, we model the growth of two-sided platforms as dual, dependent

diffusion processes. While existing literature empirically investigates the growth of two-sided platforms, none examine multinational same- and cross-side imitation effects. Second, we distinguish platform diffusion effects (the number of adopters) from participation behavior (the number of new pledges and projects) to account for the effects of repeated platform usage. This supports the notion that engagement on digital platforms is closely tied to the pathways for online word-of-mouth and communication. Third, as a result of our model formulation, we are able to generate new insights into the evolution of the Kickstarter platform over a decade, especially with respect to country-to-country influence.

Taken together, these findings lead to three primary managerial implications. First, when trying to predict the growth of a digital two-sided platform in existing markets or ones where the platform has yet to launch, managers should consider the degree to which countries/markets are connected online. Second, our parameter estimates suggest that managers of crowdfunding platforms should disproportionately invest in recruiting backers since they are otherwise less likely to join on their own as a result of innovation effects. Finally, our approach to capturing country-to-country influence could be useful for managers looking to strategically grow a worldwide digital platform on a given side or in certain locations. For example, if a manager for a crowdfunding platform wanted to stimulate creator adoption, our results suggest that France would be an ideal country to concentrate any marketing/recruitment efforts, given the sensitivity of neighboring countries (Belgium, the Netherlands, Luxembourg) to multinational participation.

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